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Attorney Docket No. 108298504US1
Disclosure No. 99-0791.01/US



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF: VISHNU K. AGARWAL

APPLICATION No.: 10/624,382

FILED: JULY 21, 2003

FOR: **APPARATUSES AND METHODS FOR
IN-SITU OPTICAL ENDPOINTING ON
WEB-FORMAT PLANARIZING
MACHINES IN MECHANICAL OR
CHEMICAL-MECHANICAL
PLANARIZATION OF
MICROELECTRONIC-DEVICE
SUBSTRATE ASSEMBLIES**

EXAMINER: TIMOTHY V. ELEY

ART UNIT: 3724

CONF. NO: 6835

Declaration of Vishnu K. Agarwal Under 37 C.F.R. § 1.131

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Vishnu K. Agarwal, declare and state that:

1. I am the sole inventor of the invention described and claimed in U.S. Patent Application No. 10/624,382 (the "present application"), filed July 21, 2003, as a divisional application of U.S. Patent Application No. 09/589,380 (the "parent application"), filed June 7, 2000. This declaration establishes invention in this country before September 14, 1999, and thus before the earliest priority date of U.S. Patent No. 6,524,164 issued to Tolles.

2. Before September 14, 1999, I conceived the invention claimed in the above-captioned application. My conception of the invention is corroborated by the signed and redacted pages of Micron Technology, Inc. Invention Disclosure Form 99-0791 (hereinafter, the "99-0791 Disclosure," attached to this Declaration as Exhibit A).

3. As shown in the 99-0791 Disclosure, I conceived of a planarizing pad for mechanical and/or chemical/mechanical planarization of a microelectronic-device substrate assembly. (See Exhibit A, page 1.)

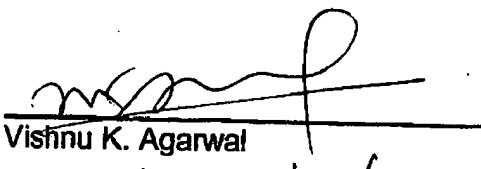
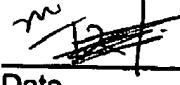
4. In one embodiment set forth in claim 24, a planarizing pad for mechanical and/or chemical-mechanical planarization of a microelectronic-device substrate assembly includes a planarizing medium having a planarizing surface with a planarizing zone defining a contact area for the substrate assembly. (See Exhibit A, Figures at page 3 illustrating the pad, and page 1, second paragraph, identifying the nature of the pad.) The planarizing pad can further include at least one optically transmissive window through the planarizing medium. The window can be in the planarizing zone. (Id.) The planarizing pad can also include an optical port through the planarizing medium. The port is outside of the planarizing zone. (See Exhibit A, Figures at pages 3-4, and page 1, second paragraph.)

5. In yet another embodiment set forth in claim 37, a method for planarizing a microelectronic-device substrate assembly includes positioning an optically transmissive window in a planarizing pad in alignment with a first light beam of an endpointing system by moving the planarizing pad along a pad travel path. (See Exhibit A, Figure at page 4, and page 1, second paragraph.) The method includes sensing when the window is aligned with the light beam and stopping the planarizing pad from moving further along the pad travel path. (Id.) The method then includes removing material from a microelectronic-device substrate by pressing the substrate against a planarizing surface of the planarizing pad and moving the substrate and/or the planarizing pad in a planarizing plane. (See Exhibit A, page 1, second paragraph.)

6. I also conceived of a further embodiment, as set forth in claim 38, wherein the method for sensing when the window is aligned with the light beam includes directing the light beam through the window to an optical sensor configured to receive the light beam when the window is aligned with the first light beam. (See Exhibit A, Figure at page 4.)

7. After conceiving this invention, I diligently proceeded by preparing the 99-0791 Disclosure with my employer, working through an initial invention review procedure, and participating in other aspects of preparing the present patent application. On June 7, 2000, I constructively reduced this invention to practice with the filing of U.S. Patent Application No. 09/589,380, now U.S. Patent No. 6,612,901, issued September 2, 2003. The present application is a divisional application of the 09/589,380 application.

8. I further declare that all statements herein made of my own knowledge are true, and that all statements made on information or belief are believed to be true; and further, that the statements are made with the knowledge that the making of willful or false statements or the like is punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and may jeopardize the validity of any patent issuing from the present patent application.

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Disclosure No. 99-0791.01/US
Vishnu K. Agarwal
Date

1/3/04

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PATENT

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APPLICATION No.: **10/624,382**

FILED: **JULY 21, 2003**

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Alexandria, VA 22313-1450

EXHIBIT A



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RECEIVED

Invention Disclosure

If ARPA project, please check below:

- Advanced SRAM
- BST
- FED
- FE RAM
- NCAICM

99-0791

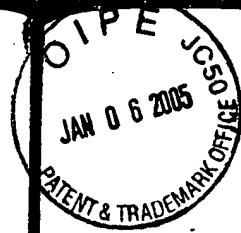
1. Inventor(s): Vishnu K. Agarwal 2941

2. Title of Invention: A end point detection method for continuous pad based (WEB) CMP tools.

2.1 General description of the invention:

Endpoint detection system in CMP has been well known and widely used for controlling process. Endpoint detection are often based on motor current or measuring change in friction and optical sensing. These method have been successfully used in current CMP tool having rotatory platen with longer lifetime pad. In optical method, a window is provided on platen and a hole/window on pad. Light passes through these windows and comes back to sensor after reflected by wafer. Reflected light allows to monitor changes on wafer.

New CMP technology is expected to use continuous fixed abrasive pad as it allows to eliminate need for costly slurry and pad conditioning. In this method, pad is moved by a desired increment for each wafer thus pad position relative to platen is changing for each wafer. End point detection developed for conventional tools could not be used in this technology. When pad is moved, window on pad may not align to window in platen and thus light would not reach to wafer during measurement. A method is proposed which allows to endpoint in new continuous pad tools. This method is based on diode feed back. During pad movement light or laser is on and as soon as window in pad align with window in platen, diode will sense and stop further pad movement. Thus using this feed back system, it can be assured that light will reach to wafer. Method is explained in attached figures.



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Notebook #100928

Project Number

Subject

Date

1

A method to end point detection for
WEB ~~base~~ barrel CMP tools.

5

10

15

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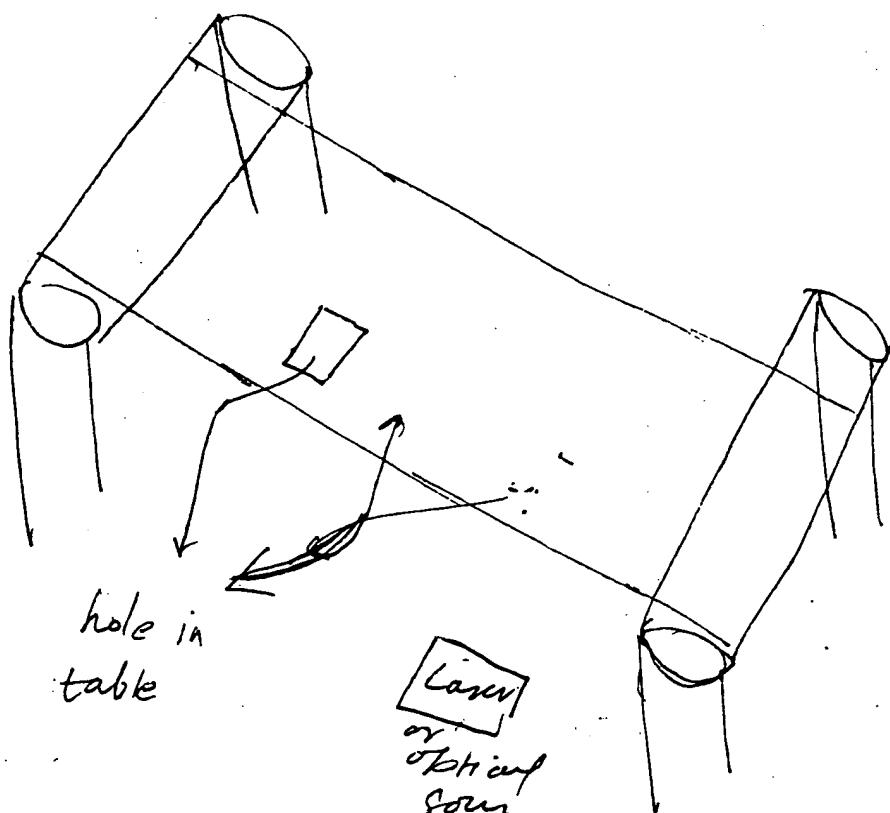
25

30

35

40

Please do not write in the margin



Author's Signature:

Date: _____

Witness' Signature:

Date: _____

(Read and Understood)

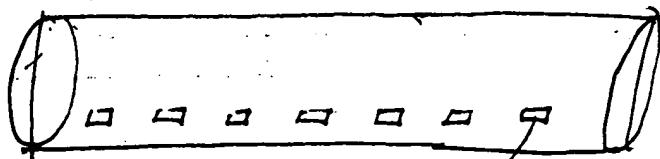
(2)

Project Number

Subject

Date

1



hole in pad. at certain
distance

10

15

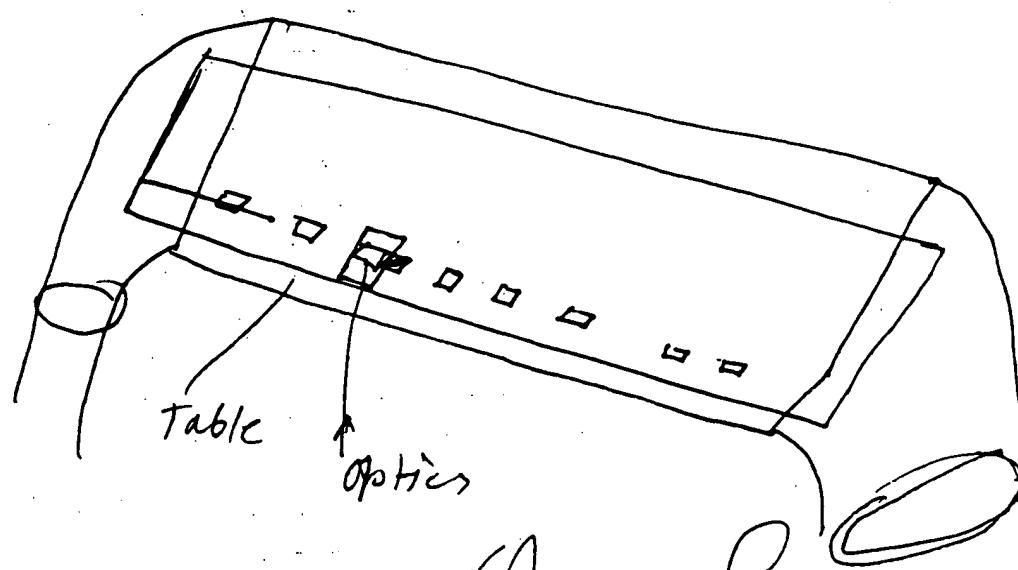
20

25

30

35

40



Author's Signature: John M. Morris Date: _____

Witness' Signature: John M. Morris Date: _____

(Read and Understood)

Project Number

Subject

Date

1

Feed back

diode (sense light)
or laser

5

laser/optical
sour

10

Pad roll is moved in \pm x and \pm y direction to aligned for end point detection hole.

15

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25

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Please do not write in the margin

Author's Signature:

Witness' Signature:

(Read and Understood)

Date:

Date:

2.2 (a) Describe what problem the invention is trying to solve:

2.2 (b) Describe what prior solutions have been used to solve this problem:

2.2 (c) Describe the advantages of this invention over these prior solutions:

2.2 (d) Describe how the invention works:

See above.

2.3 Also attach a complete description, including drawings or sketches and articles relevant to the invention. Legible photocopies of laboratory notebooks are acceptable.

3. Information Concerning Conception Of Invention

3.1 Conception And Documentation Of The Invention

- a. Identify the date when you first conceived the invention. (If not sure, give the earliest date of which you are sure.)

- b. To whom was the idea first described and on what date? (Other than a co-inventor.)

- c. Identify the date of the first tangible record such as computer simulation, tape out, drawing or written description. Please specify type and location.

3.2 Conception Of The Invention

- a. Please identify related invention disclosures, patents or other publications describing similar ideas, and other companies working in the same field. Attach copies, if available.
- b. What is the closest technology, of which you are aware?

Described in state-of art description of this claim.

- c. Identify the advantages of this invention over previous technology.

3.3 Important Dates

- a. Has the invention been disclosed outside the company? No
If yes, to whom, when, and in what form?
- b. Have any articles describing your invention been published? No
If yes, list author(s), title of article, publication and date.
- c. Have any engineering samples been given out? No
If yes, to whom and on what date?
- d. Has any product using the invention been sold or offered for sale? No
If yes, to whom and on what date?

3.4 Disposition Of The Invention

- a. When will (or did) Micron begin use of the invention experimentally?
- b. When will (or did) Micron begin production of this invention?

3.5 Miscellaneous Information

- a. Was the invention developed during a joint development agreement or other contract with an outside company? No
- b. Please list developmental work outside of the company (including Government proposal or contract).

4. Inventors:

Name: Vishnu K. Agarwal

Micron Phone: (208)368 Micron Mail Stop: 306

2919

Company Name(Very Important): Dept. Name: Fab 4 Diffusion

Micron Technology, Inc. Dept. #: 854
 Micron Computer, Inc.
 Micron Custom Manufacturing Services, Inc.
 Micron Display Technology, Inc.
 Micron Communications, Inc.
 Other _____

Home Address: Citizenship: India

Supervisor: Dr. Dan Gealy

Signature: _____ Date: _____

Name:

Micron Phone: 208 368 3186 Micron Mail Stop: 306

Company Name(Very Important): Dept. Name:

Micron Technology, Inc. Dept. #:
 Micron Computer, Inc.
 Micron Custom Manufacturing Services, Inc.
 Micron Display Technology, Inc.
 Micron Communications, Inc.
 Other _____

Home Address:

Citizenship:

Supervisor:

Signature: _____ Date: _____

Name:

Micron Phone: 208 368 3186 Micron Mail Stop: 306

Company Name(Very Important): Dept. Name:

- Micron Technology, Inc. Dept. #:
- Micron Computer, Inc.
- Micron Custom Manufacturing Services, Inc.
- Micron Display Technology, Inc.
- Micron Communications, Inc.
- Other _____

Home Address:

Citizenship: USA

Supervisor:

Signature: _____ Date: _____

5. WITNESS

If there is only one inventor, a witness should sign and date this disclosure. A witness in this case is a non-inventor who undersatnds the nature of the invention.



(Signature of Witness)

(Date)

(G) Claims 27-29, 32, 33, 35, and 36 were objected to as being dependent upon a rejected base claim, but were indicated to be allowable if rewritten in independent form to overcome the Section 112, second paragraph rejection and to include all the features of the base claim and any intervening claims; and

(H) Claims 44 and 45 were allowed.

A. Response to the Objection to the Specification

The specification was objected to because the cross-reference to U.S. Patent Application No. 09/589,380 was not updated to include a corresponding reference to the patent issuing from this application. The specification has been updated to include the appropriate patent number and, accordingly, the objection to the specification should be withdrawn.

B. Response to the Section 112 Rejection of Claims 27-29, 32, 33, 35, and 36

Claim 27-29, 32, 33, 35, and 36 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter that the applicant regards as the invention. The present non-narrowing amendments to claims 27, 32, and 35 largely adopt the Examiner's suggested changes. Therefore, this rejection of claims 27-29, 32, 33, 35, and 36 should be withdrawn.

C. Response to the Section 102 Rejection of Claims 24, 26, 30, 37, and 38

Claims 24, 26, 30, 37, and 38 were rejected under 35 U.S.C. § 102(e) as being anticipated by Tolles. These claims were rejected on the grounds that "Tolles discloses a planarizing pad having at least one optically transmissive window (62) and an optical port (80) [that] comprises a notch along an edge of the pad." (Office Action, paragraph 5a.) Claim 30 has been cancelled, therefore the rejection of this claim is now moot.

The rejection of claims 24, 37, and 38 over Tolles should be withdrawn because this reference does not qualify as prior art under § 102(e). The enclosed Declaration of Vishnu K. Agarwal under 37 C.F.R. § 1.131 (the "Declaration") establishes conception of aspects of the invention identified in claims 24, 37, and 38 before September 14,

1999, and therefore before the earliest priority date of Tolles. Support for the features of claim 24 are set forth in the Declaration at paragraph 4. Support for the features of claims 37 and 38 are provided by the Declaration at paragraphs 5 and 6, respectively. Accordingly, the Section 102 rejection of claims 24, 37, and 38 should be withdrawn.

Although Tolles does not qualify as prior art under § 102(e) with respect to independent claims 24 and 37, the undersigned respectfully submits that these claims are further patentable over Tolles under Section 102 because this reference fails to disclose several features of these claims. For example, Tolles fails to disclose or suggest an optical port through a planarizing medium that is located outside of a planarizing zone as taught by claim 24. As shown in Figure 8A-8C of Tolles, the apertures 62 and 67 extend through the bottom layer 60 and top layer 66, respectively, of the polishing pad. Tolles discloses that the entire top layer is a "polishing surface" used to polish a workpiece. (Tolles, col. 2, Ins. 47-49.) Accordingly, the apertures 62 and 67 in Tolles cannot be "outside of the planarizing zone" as set forth in claim 24.

Furthermore, claim 37 teaches a method for planarizing a microelectronic-device substrate assembly including sensing when a window is aligned with a light beam and stopping a planarizing pad from moving further along the pad travel path. In contrast, Tolles does not teach or suggest stopping the planarizing pad from moving further along the pad travel path after sensing the light. At best, the apertures through the polishing pad in Tolles "allow a laser interferometer, in or below the platen on which the pad is mounted, to be employed to detect the polishing condition of a wafer overlying the pad without significant diffraction of the laser light." (Tolles, col. 2, Ins. 57-61.) Although Tolles may sense the return signal from the wafer, it does not disclose stopping the pad from moving along the path after sensing the signal. Accordingly, Tolles fails to disclose or suggest several features of both claims 24 and 37 and, therefore, for these additional reasons the § 102 rejection of claims 24 and 37 should be withdrawn.

Claim 26 is patentable over Tolles for the reasons explained above with reference to base claim 24, and also because of the additional features of claim 26. Therefore, the rejection of claim 26 should be withdrawn.

D. Response to the Section 102 Rejection of Claims 24 and 25

Claims 24 and 25 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Jairath. Referring to Figure 3 of Jairath, the Office Action asserts that "Jairath et al. discloses a planarizing pad having at least one optically transmissive window (322, 328, 326) and an optical port (324) which comprises a hole through the pad." (Office Action, paragraph 6a.)

Jairath is directed to a linear polishing belt for chemical-mechanical polishing (CMP) of a workpiece. Referring to Figures 2 and 3, Jairath discloses a polisher 200 including a substrate carrier 210, a belt 220, and a platen 240. As the belt 220 moves linearly under the workpiece during the CMP process, an opening in the belt 220 pass over a corresponding opening in the platen 240. When the openings are aligned, in-situ monitoring of the workpiece is performed using a film thickness monitor 250. (Jairath, col. 5, Ins. 12-38.) In the embodiment shown in Figure 3, a belt 310 includes a plurality of openings 320, 322, 324, 326, and 328. For each opening in the belt 310, there are corresponding openings 330, 332, 334, 336, and 338 in the platen under the substrate carrier 340. Each opening 330, 332, 334, 336, and 338 is aligned with a respective film thickness monitor. (Jairath, col. 6, Ins. 9-16.) Jairath teaches that the plurality of film thickness monitors distributed under respective locations of the belt 310 allow measurement of non-uniformity of the polishing process across the entire surface of the workpiece. (Jairath, col. 6, Ins. 22-24.)

Claim 24 is patentable over Jairath under Section 102 because this reference fails to disclose several features of the claim. As discussed above, claim 24 teaches an optical port through a planarizing medium that is located outside of a planarizing zone. Conversely, the openings 320, 322, 324, 326, and 328 in the belt 310 of Jairath are positioned within the planarizing zone of the belt 310 to allow measurement of non-uniformity of the polishing process across the entire workpiece surface. Therefore, to be functional in accordance with the teachings of Jairath, the openings 320, 322, 324, 326, and 328 cannot be "outside of the planarizing zone." Accordingly, the rejection of claim 24 under Section 102 over Jairath should be withdrawn.

Claim 25 is patentable over Jairath as depending from base claim 24, and also because of the additional features of claim 25. Therefore, the rejection of claim 25 should be withdrawn.

E. Response to the Section 103 Rejection of Claim 34

Claim 34 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,537,144 to Tsai in view of Tolles. Without commenting on or conceding to the merits of this rejection, this rejection is improper because the subject matter disclosed in Tolles does not qualify as prior art in the view of the Declaration enclosed with this response. Accordingly, the Section 103 rejection of claim 34 should be withdrawn.

F. Response to the Objection to Claims 31 and 39-43

Claims 31 and 39-43 were objected to as being dependent upon a rejected base claim, but were indicated to be allowable if rewritten in independent form to include all of the features of the base claim and any intervening claims. Claim 31 has been cancelled, and thus this objection is now moot. Claims 39-43 are allowable as depending from allowable base claim 37, and also because of the additional features of these dependent claims. Therefore, the objection to claims 39-43 should be withdrawn.

G. Response to the Objection to Claims 27-29, 32, 33, 35, and 36

Claims 27-29, 32, 33, 35, and 36 were objected to as being dependent upon a rejected base claim, but were indicated to be allowable if rewritten in independent form to overcome the Section 112, second paragraph rejection and to include all the features of the base claim and any intervening claims. Claim 32 has been rewritten in the stated form. Furthermore, as mentioned above, claim 32 has been amended in accordance with the Examiner's suggestions to overcome the Section 112, second paragraph rejection. Therefore, the objection to claim 32 should be withdrawn. The objection to claim 33 should also be withdrawn because this claim depends from claim 32.

Claims 27 and 35 have been amended in accordance with the Examiner's suggestions to overcome the Section 112, second paragraph rejections. Therefore, claims 27-29, 35, and 36 are allowable as depending from corresponding allowable base claims 30 and 34, and also because of the additional features of these dependent claims. Accordingly, the objection to claims 27-29, 35, and 36 should be withdrawn.

H. Allowed Claims

Claims 45 and 46 were allowed.

I. New Claim 46

New claim 46 has been added to the present application. The subject matter of this claim is supported by the figures and the text of the original application. Therefore, this claim does not add any new matter to the application, and is fully supported under Section 112, paragraph one.

Conclusion

In view of the foregoing, the pending claims comply with 35 U.S.C. § 112 and are patentable over the applied art. The applicant respectfully requests reconsideration of the application and a mailing of a Notice of Allowance. If the Examiner has any questions or believes a telephone conference would expedite prosecution of this application, the Examiner is encouraged to call the undersigned at (206) 359-3982.

Respectfully submitted,

Perkins Coie LLP



Aaron J. Poledna
Registration No. 54,675

Date: 1/6/05

Correspondence Address:

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Perkins Coie LLP
P.O. Box 1247
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(206) 359-8000

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